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A program providing inservice training for elementary school teachers using modern mathematics textbooks was presented. For a period of 13 weeks, one-half hour lectures were given via television one day a week after school hours. The public schools, a local television station, a state college, and a team representing the National Council of Teachers of Mathematics cooperated.

The main body of the project consisted of a set of kinescopes which were devoted to mathematics content and teaching suggestions. Lesson notes were distributed prior to each telecast. A discussion period followed each telecast. Since the telecasts were recorded, the project director and lecturer could visit with groups of teachers and answer questions during the review and discussion period. At the close of the project, teachers submitted evaluation sheets.

Difficulties expressed by teachers were that they did not understand the subject matter clearly, the textbook materials were not available so application was difficult, and the lesson notes did not give enough suggestions regarding implications for their own classroom instruction. Nevertheless, the program increased teacher awareness of changes taking place in mathematics. More teachers submitted requests to take summer courses in mathematics.

The visiting team stated that the personality of the television instructor was a strong factor; her personal contacts added to the instructional value. The team recommended that classroom instruction methods and mathematics content should be developed separately in parallel series, follow up discussions and guideline notes should be used, and strong support from school principals should be obtained.

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Foundations of mathematics for elementary schools: an in-service project

Rare indeed today is the school system that does not recognize a need for in-service education in mathematics for its elementary school teachers. Rare indeed, too, is the school system that is not seeking some means to satisfy this need effectively.

No one way is necessarily best for all situations. However, for understandable reasons there is increasing interest in the use of television in connection with in-service education. This report deals with one city's school system's recent efforts along this line.

Pretend that you have in your hands a copy of the December, 1962 issue of the *Des Moines School News and Views*. Turn to page 4 and read a portion of the article entitled "KDPS-TV Offers In-Service Telecasts For Teachers":

> KDPS-TV has launched a far-reaching series of teacher in-service telecasts.
>
> Over 1,000 teachers from Des Moines and other central Iowa school systems sit down after a full school day on Wednesdays for on-the-job instructions by means of TV. Since television has become a major tool of instruction, department heads in mathematics, art, Spanish, and a variety of other subjects in the Des Moines schools and the surrounding area have found it an increasingly useful means of orienting teachers in the latest subject matter content and educational technique. This media is potent with diverse possibilities for offering high quality professional growth in an economy of time.
>
> An example of this is currently going on in the area of elementary school arithmetic. The Des Moines school system is in the process of selecting a new arithmetic textbook series for K-8. The decision was made by the committee that this series should reflect the modern trends in mathematics education. Since many of the teachers do not have a background in modern math, the situation seemed to demand some in-service training.
>
> Last spring leaders of the Department of Elementary Education and the Supervisor of Mathematics took the initial steps toward this in-service experience by bringing together the KDPS staff and mathematics specialists from the State College of Iowa under the leadership of Dr. H. C. Trimble. The idea itself was just the spark needed to motivate the SCI Extension Service and Dr. Trimble's staff into action. Dr. Glenadine Gibb of the Mathematics Department staff was assigned to work on this project. Knowing the great need in the elementary school arithmetic program, she went to work, soliciting NSF funds for the purpose of preparing the materials needed to make a dynamic new TV in-service project practical. Both the college and the station pledged significant and tangible support to the extent of thirteen, thirty-minute television programs for teachers. . . .

Much widespread interest was created in this project whose origin has just been described. For this reason arrangements were made for a team[1] representing the National Council of Teachers of Mathematics to visit the project center in Des

[1] The members of the visitation team included the following persons: Warren J. Bell (Consultant, Science and Mathematics, Kansas State Department of Public Instruction), E. Wayne Bundy (Program Manager, KNME-TV, Albuquerque), Edwina Deans (Specialist for Elementary Mathematics, U. S. Office of Education), William T. Guy (Chairman, Department of Mathematics, University of Texas), Alice M. Hach (Coordinator for Mathematics, Ann Arbor Public Schools), Aileen Seabury (President, Iowa Association of Childhood Education), Eleanor Wheeler (President, Iowa Department of Elementary School Principals), and J. F. Weaver (Professor of Mathematics Education, Boston University).

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Moines[2] last May, and to report upon the project in these pages of THE ARITHMETIC TEACHER.

Project features

The heart of the project was a set of kinescopes (thirty minutes each) devoted to mathematics content and related teaching suggestions, presented by Professor Gibb. The television lessons included the following:

1. What Are Numbers?
2. Systems of Numeration
3. The Fundamental Operations of Arithmetic
4. In the Classroom
5. Techniques of Computation Using Whole Numbers
6. Using Mathematics in Solving Problems
7. Using Mathematics to Solve Problems (Part II), Including an Idea of Ratio
8. The Fractional Numbers—Concept and Operation
9. The Fractional Numbers—Multiplication
10. The Fractional Numbers—Division and Problem Solving
11. The Integers—Measurement and Direction
12. Some Simple Geometric Ideas
13. Measures of Some Geometric Figures
14. Looking Back—Looking Ahead

All elementary school teachers in Des Moines participated in the in-service program during the 1962–63 school year. An orientation session with the project director was held at the outset, at which time it was emphasized that:

> The administrative staff of your school and the State College of Iowa are providing the opportunity for a study of the structure of mathematics and implications for teaching elementary school mathematics based on the structure of mathematics rather than on techniques of computation.
>
> These materials reflect the goals we believe to be the basis for teaching mathematics in the elementary school. These are:
>
> 1) Helping the children learn to participate in the process of discovery and creation that precedes . . . .
>
> 2) Making generalizations which grow out of an intuitive understanding of the underlying basic principles of mathematics from which we develop processes for addition, subtraction, multiplication, and division using the natural numbers and the rational numbers of arithmetic before . . . .
>
> 3) Developing techniques and skills in the use of these computational procedures.
>
> This does not mean that it is no longer necessary to learn skills and techniques of computation. These still are an important part of the program.[3]

Prior to each telecast, lesson notes prepared by Professors Gibb and Schurrer were distributed to the teachers. These notes were related to the content of the coming telecast and were intended to introduce and augment the telecast material. The notes were not transcriptions of the telecast itself.

Each lesson (notes and telecast together) gave predominant emphasis to appropriate mathematical content *per se*. However, some portions of most lessons considered implications for classroom instruction.

Telecasts were viewed by groups of teachers from a particular building or geographical area. A discussion period followed each telecast. A secondary school mathematics teacher and an elementary school teacher served as a consultant-team for the discussion period.

Each telecast was recorded on video tape in advance of its viewing by teachers. This enabled the project director to visit a group of teachers while they viewed each telecast, to participate in the discussion period, and to assess teachers' reactions on a first-hand basis.

[2] The members of the visitation team appreciate greatly the efforts of Professor Gibb and her associate, Professor Augusta Schurrer, and of the following Des Moines staff members in connection with the team's visit: Wilson Goodwin (Supervisor of Mathematics), Sarah Page (Elementary Supervisor), Marjorie Schwien (Elementary Consultant), Joan Sherman (Elementary Consultant), and John Montgomery (Director of Educational Television).

[3] E. Glenadine Gibb and Augusta L. Schurrer, "Foundations of Mathematics for Elementary Schools," p. 2, Unpublished Preliminary Form.

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Teachers were encouraged to submit to the project director questions that may have arisen during a telecast or subsequent discussion. In some instances such questions were answered in connection with a future telecast. In other instances answers were prepared by the project director, and duplicated question-and-answer sheets were distributed to all teachers.

At the close of the series of lessons teachers submitted to the project director evaluation sheets covering their reactions to various facets of particular lessons and to the program as a whole.

During the course of the project the director visited in classrooms and worked closely with supervisory staff members.

All in all the project served to *introduce* elementary school teachers to appropriate mathematical content from a contemporary point of view. The series of lessons did not constitute a mathematics *course* in the usual sense of that term. Teachers received no credit, neither college credit nor local professional in-service credit, for their participation.

Visitation team activities

The team's visit extended over a two-day period. At the outset the team members had a briefing session with the project director and her associate and with the Supervisor of Mathematics and the Elementary Supervisor from Des Moines.

Classrooms in twelve different schools were visited by pairs of team members. Each pair of team members was accompanied by a Des Moines supervisory staff member, and the pairs were changed from the first day's visits to the second day's visits.

Video tapes for a sampling of the telecasts were viewed by the team members as a group. Opportunity was provided for discussion of the telecasts with the producer of the series. One of the team members had an opportunity to view the actual taping of one of the telecasts. The project director was available for clarification and discussion of various facets of the program throughout the course of the team's visit.

Reactions, suggestions, and the like from visitation team members were presented informally to representatives from the State College of Iowa and the Des Moines Public Schools in conjunction with a luncheon meeting at the close of the visit.

Finally, team members transmitted in writing to the team chairman their individual reactions and recommendations.[4] These formed the basis for the following section of this report.

Reactions and recommendations

"Foundations of Mathematics for Elementary Schools" originated as an in-service project to meet the needs of a particular school system,—that in Des Moines, Iowa. It soon became evident, however, that the project materials (kinescopes and lesson notes) and plan of operation might have a much more extended use in the future. The Des Moines supervisory staff was especially interested in reactions to the project as a local in-service venture. The project director, on the other hand, expressed a strong desire for candid appraisal of the project materials from the standpoint of their suitability for wider circulation and future use. Thus, this section of the report is organized into two parts, (1) teachers' reactions and (2) project extension.

Teachers' reactions

The unique personality of the project director-television teacher was a strong positive factor in the in-service program. Her personal contacts with teachers during the course of the program added to the effectiveness of the telecasts. She became a "real" person whom the teachers had seen face to face and with whom they had talked. She was much more than an image on a screen.

[4] Although the visitation team represented the National Council of Teachers of Mathematics, recommendations and so forth appearing in this report have been made by the team members as a group of individuals. No official endorsement of these recommendations by the Council is intended or implied in this report.

The lesson notes (preceding each telecast) and the follow-up discussions were helpful adjuncts to the telecasts. Unfortunately, however, on occasion the notes did not reach teachers sufficiently in advance of a telecast for them to be able to study the notes before viewing a particular lesson.

Serious attempts were being made by many teachers to translate their own learning into improved instructional practices in their own classrooms. This appeared more evident at the second grade level than at any other. A contributing factor here undoubtedly was the fact all second-grade classes in Des Moines were receiving brief periods of televised instruction several times each week throughout the year.

Teachers expressed several reasons for encountering some difficulty in translating their own learning into improved instructional practices in their own classrooms. For example, (1) there were few materials (textbooks, etc.) available for use that reflected the spirit and approach of the in-service project; (2) the mathematical content covered by the lesson notes and telecasts was on a higher level than they understood clearly; (3) the lesson notes and telecasts did not give enough suggestions regarding implications for their own classroom instruction. (These latter two reactions will be considered further in a subsequent section of this report.)

Some teachers expressed the hope that the telecasts would be repeated during the 1963–64 school year so that certain ones could be viewed a second time.

In quite a few instances teachers commented that the time of the telecasts—at the end of the school day on Wednesday—was not most appropriate. (This observation will be considered further in a subsequent section of this report.)

As was noted previously, all elementary school teachers participated in the in-service program. This included "special" teachers of physical education, art, music, etc.—teachers who provided no mathematics instruction within the elementary schools. In more than one instance it was difficult for such a teacher to see the necessity for her participation in an in-service program devoted to mathematics.

In some instances teachers felt that the in-service program had been implemented rather abruptly, and that they had not been adequately oriented and prepared for the program.

Some questions were raised regarding the advisability of having the in-service program extend over the major portion of the school year. Of particular concern was the fact that the program continued until very near the end of the year.

All in all, the program greatly increased teachers' awareness of changes taking place in mathematics and in mathematics materials and practices at the elementary school level. This was a major purpose of the program. Without doubt, it was achieved to a marked degree. Although it is difficult to ascertain a cause and effect relation here, it was pointed out by the Elementary Supervisor that more teachers than ever before had submitted requests for taking summer courses, etc. in mathematics.

Des Moines' in-service needs in relation to mathematics instruction in the elementary schools certainly have not been met completely. However, the 1962–63 in-service project represented an excellent point of departure and base upon which to build further in-service activities.

Project extension

The members of the visitation team were very favorably impressed with the content and materials developed in connection with the project. The members of the team have recommended to all concerned that the materials be revised along certain lines, however, and then be made available in revised form for in-service use in general.

Several things prompted the recommendation that the materials be revised before being released for wider in-service use.

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1 One compelling reason for revision is a technical one. Not all cameras used in preparing the kinescopes were of comparable high quality. Consequently, portions of some kinescopes are not up to desirable standards. It is recommended that the complete series of telecasts be redone with comparable high-quality cameras. This would not only result in technical improvements, but would provide an opportunity for other improvements to be made as well. (In a sense some of these also are of a technical nature, relating to staging, direction, and the like; and leading to a production in which the television teacher would be able to maintain a more uniformly high level of performance in light of previous experience.) It was further suggested that the revised video tapes also be transferred to film for use wherever 16 mm. projectors are available.
2 A second significant reason for revision of the complete series of lessons relates to the content of the program. This matter received extended discussion among the team members. As was mentioned earlier in this report, quite a few teachers expressed the feeling that the mathematical content covered by the lesson notes and telecasts was on a higher level than they could understand clearly, and that the lesson notes and telecasts did not give enough suggestions regarding implications for their own classroom instruction. It should be noted at this point that apparently numerous teachers missed the import of two things emphasized to them by the project director from the outset: (a) the content of the program was definitely intended to be mathematical rather than "pedagogical," and (b) the lesson notes and telecasts would but *introduce* teachers to various mathematical ideas. Members of the visitation team agreed that two things are needed in connection with in-service work: appropriate mathematical content, and consideration of implications for classroom instruction. Not all team members agreed, however, as to the way in which these two things should be interrelated within an in-service program. Much discussion led to the following consensus, however, concerning the recommended revision of lesson notes and telecast lessons.

(a) Both should be restricted to mathematical content alone. (Suggestions were given regarding format and content of lesson notes as well.) In general, the scope of content developed should be the same as in the initial series, but the elimination of "implications for the classroom" would permit fuller development of some aspects of mathematical content.

(b) It would be desirable to develop a parallel series of telecasts and notes that would treat the problem of improved classroom instruction (including instructional materials).

(c) Even without (b) above, a school system could use (a) to good advantage and make its own provisions to cover classroom implications in a manner unique to its own needs.

In essence, then, the visitation team urged all concerned to make possible for wide-scale distribution and use a revised series of kinescopes and lesson notes devoted exclusively to mathematical content.

Broader implications

In addition to things already mentioned, the members of the visitation team wish to make some observations that have broader implications for in-service programs in mathematics for elementary teachers.

1 Television alone is inadequate. To be most effective it must be used in conjunction with other techniques (e.g., follow-up group discussions under competent leaders). Some possibilities along this line are illustrated in the case of the project being reviewed.
2 When television is used, it may be advantageous to arrange that the same

telecast lesson be shown at more than one time on more than one day.

3 Careful preparation for and orientation to an in-service program are important. Provisions for evaluation and extension into the future also are important.

4 Strong support from elementary school principals, in their role as instructional leaders, is imperative for the success of an in-service program.

In conclusion

Rare indeed today is the school system that does not recognize a need for in-service education in mathematics for its elementary school teachers. Rare indeed, too, is the school system that is not seeking some means to satisfy this need effectively.

It is our sincere hope that the visit reported here may lead to various new means of meeting this need.

Announcement

The Cooperative Research Branch of the United States Office of Education contracts with colleges, universities, and State education departments for research and related activities in the field of education. Recently the scope of the Program has broadened to include the activities described below:

1. *Basic and Applied Research Program.* Included in this area are projects using controlled experimental research; surveys; correlational, methodological, and case studies; and developmental and historical studies. The subjects with which these projects deal cover topics related to education and learning at all levels.

2. *Curriculum Improvement Program.* This program will now entertain proposals in any content area of education. The objectives of these projects are to (1) clarify or redefine the nature and aims of a content area, (2) develop sequential patterns and instructional materials and methods in a subject matter area, and (3) disseminate the most promising materials and methods.

3. *Developmental Activities Program.* The aim of this program is to stimulate and improve research and development in education. Examples of activities appropriate under this program are: (a) analytical and integrative reviews of research and development literature, (b) conferences on planning research, dissemination, curriculum improvement and research design, and (c) development of experimental devices and materials, new evaluative instruments and techniques, and taxonomies, models and theories. Participation in the Developmental Activities Program is invitational.

4. *Demonstration Program.* The major purpose of this program is to demonstrate and disseminate applications of new educational techniques and materials which have been evaluated and are now operational. Demonstrations in all fields of significance to education are appropriate.

5. *Small Contract Program.* This program is designed to make funds available for small-scale research and development projects in a relatively short time. The maximum amount of money which may be requested is $7500.

6. *Research and Development Centers.* These centers are designed as affiliations of colleges and universities, State departments of education, and local school systems in which researchers, administrators, scholars, and teachers will conduct programmatic research in a given area of concern to education.

Deadlines for submission of applications for each of these programs is as follows: September 1, December 1, and March 1 for the basic and applied research, curriculum improvement, demonstration programs, and September 1 and March 1 for research and development centers; there are no deadlines for the small contract and developmental activities programs.

Application instructions are available for these various programs from:

Cooperative Research Branch
U.S. Office of Education
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